

AMSAT News Service Weekly Bulletins

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AMSAT NEWS SERVICE

ANS-186

The AMSAT News Service bulletins are a free, weekly news and information service of AMSAT North America, The Radio Amateur Satellite Corporation. ANS publishes news related to Amateur Radio in Space including reports on the activities of a worldwide group of Amateur Radio operators who share an active interest in designing, building, launching and communicating through analog and digital Amateur Radio satellites.

The news feed on <http://www.amsat.org> publishes news of Amateur Radio in Space as soon as our volunteers can post it.

Please send any amateur satellite news or reports to:
ans-editor at amsat.org.

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ANS-186 AMSAT News Service Weekly Bulletins

AMSAT News Service Bulletin 186

>From AMSAT HQ KENSINGTON, MD.

July 5, 2015

To All RADIO AMATEURS

BID: \$ANS-186

AMSAT 2015 Symposium Call for Papers

This is the first call for papers for the 2015 AMSAT-NA Annual Meeting and Space Symposium to be held on the weekend of October 16-18, 2015. Proposals for papers, symposium presentations and poster presentations are invited on any topic of interest to the amateur satellite community. We request a tentative title of your presentation as soon as possible, but no later than August 1. The final copy must be submitted by September 15 for inclusion in the printed proceedings. Abstracts and papers should be sent to Dan Schultz at n8fgv at amsat.org

The 2015 AMSAT Space Symposium and Annual Meeting will be held October 16, 17, 18, 2015 at the Crowne Plaza Hotel, 33 East 5th Street, in Downtown, Dayton, Ohio.

[ANS thanks the 2015 Symposium Committee for the above information]

Reminder - Send in AMSAT Field Day Results

Please send your AMSAT Field Day results to Bruce Paige, KK5D0.

Refer to the
AMSAT Field Day web page at http://www.amsat.org/?page_id=216
for a copy of the rules document. This also includes the format of
the Satellite Summary Sheet.

The Satellite Summary Sheet should be used for submission of the
AMSAT Field Day competition and be received by KK5D0 (email or postal
mail) by 11:59 P.M. CDT, Monday, July 13, 2015. The preferred method
for submitting your log is via e-mail to [kk5do\(a\)amsat.org](mailto:kk5do(a)amsat.org) or
[kk5do\(a\)arrl.net](mailto:kk5do(a)arrl.net). You will receive an email back (within one or two
days) from me when I receive your email submission. If you do not
receive a confirmation message, then I have not received your
submission. Try sending it again or send it to my other email address.

You may also use the postal service but give plenty of time for your
results to arrive by the submission date. If mailing your submission,
the address is:

Bruce Paige, KK5D0
AMSAT Director of Awards and Contests
PO Box 310
Alief, TX 77411-0310

Please add photographs or other interesting information that can be
used in an article for the Journal.

Certificates will be awarded to the first-place emergency
power/portable station at the AMSAT General Meeting and Space
Symposium in the fall of 2015. Certificates will also be awarded to
the second and third place
portable/emergency operation in addition to the first-place home
station running on emergency power. A station submitting high, award-
winning scores will be requested to send in dupe sheets for analog
contacts and message listings for digital downloads.

[ANS thanks Bruce Paige, KK5D0, AMSAT Director of Awards and
Contests for the above information]

\$50SAT 19 months in Space and still working

Michael Kirkhart KD8QBA provides an update on the \$50SAT amateur
radio spacecraft which measures just 5x5x7.5 cm

Sunday, June 21, 2015 marked the 19 month anniversary of the launch
of \$50SAT/M0-76/Eagle-2. The good news is it still operating. The
bad news is the power situation has been degrading, with an apparent
step change on or near May 12, 2015, followed by another on Tuesday,
June 23, 2015. The last full telemetry capture made here in EN82
land was on Wednesday, May 27, 2015, and the last time it was heard
was on Friday, June 6, 2015. I continued to attempt to listen for it
for another week or so, and heard nothing. Has anybody heard it
since then?

At this point, I have been monitoring it using Anton's (ZR6AIC) WebSDR as it makes daytime passes over South Africa. These occur between 7:30 and 9:00 UTC, which translates to 3:30 and 5:00 AM here in EN82 land. This is tough, as I am not a morning person. Sometimes, however, you have to do these things; helping build a satellite might be a once-in-a-lifetime event. During these passes, where it has already spent a significant amount of time in sunlight, the battery voltage is below 3400 mV. Is the battery going bad? While it is certainly possible the battery has suffered from some loss of charge capacity, one has to remember it does not generate energy; it merely stores it. Since it is the solar power system that generates the power used by the satellite and stored in the battery, could the drop in battery voltage be due to a degradation in solar power generation?

Back around May 12, I noticed the MPPT (solar) current readings were typically less than 10 mA. This much lower than it should be. To better understand what might be going on, a new chart was added to the telemetry spreadsheet which shows both the battery voltage and the MPPT (solar) current (with the zero readings removed), each with its own linear regression line. This chart can be seen from the following URL:

<https://www.dropbox.com/sh/l3919wtfiyw2gf/AABKSR5V4c0vEPqPYbs8QYZNa/Telemetry-analysis/Current-Telemetry/Battery-Voltage-MPPT-Current-Chart.pdf>

Notice how the MPPT current trend line has been sloping downward, similar to that of the battery voltage. Moreover, starting 2 weeks before June 4, 2015 (each X axis division on the chart represents 2 weeks time), each reading has been at or below the trend line.

A more striking comparison can be seen by doing the following:

1. Zoom in of the Battery-Voltage-MPPT-Current-Chart to show the 4 week interval starting May 7, 2015, and ending June 4, 2015 (see <https://www.dropbox.com/sh/l3919wtfiyw2gf/AACdQtySHZW3kVl7UMgSrxHfHa/Telemetry-analysis/Battery-Voltage-MPPT-Current-Comparison-2015-05/Battery-Voltage-MPPT-Current-2015-05.pdf>)

2. Zoom in of the Battery-Voltage-MPPT-Current-Chart to show the 4 week interval starting May 8, 2014, and ending June 5, 2014 (see <https://www.dropbox.com/sh/l3919wtfiyw2gf/AACracUWkivilfsKGBUFkmDXa/Telemetry-analysis/Battery-Voltage-MPPT-Current-Comparison-2015-05/Battery-Voltage-MPPT-Current-2014-05.pdf>)

[Editor's Note: The URLs above don't port well via tinyurl.com and have been truncated to fit the ANS format requirements. They should be copy and pasted as a continuous line to work with most browsers.]

In comparing these charts, it is clear both the battery voltage and the MPPT current were significantly lower this year than during the same period last year. On June 5, 2014, the trend line value for battery voltage was about 3610 mV, and for MPPT current was about 30 mA. One year later (June 4, 2015), the trend line value for battery voltage was about 3380 mV, and for MPPT current was about 14 mA. Therefore, while it is likely the battery has suffered some loss of capacity, it appears the low battery voltage is due to low solar power output. There are many possible reasons for this, including:

* Solar cell damage due to sputtering: since there was no protective covering on the solar cells, impacts from high energy particles can damage the cells, causing a drop in output.

* Solar cell damage due to thermal cycling: We know from telemetry data the interior of the satellite cycle between +30 degrees C and -30 degrees C each orbit. It is likely the exterior temperatures experienced higher extremes, and this periodic thermal cycling may have caused the solar cells to fracture, thus leading to a drop in output.

* Short circuit failure of one or more of the diodes which isolate each MPP tracker output, which can cause an inactive MPP tracker (one whose corresponding solar panel is not facing the sun) to load an active one (one whose corresponding solar panel is facing the sun).

Because of the limited amount of telemetry gathered, it may not be possible to determine the exact cause. If the solar output power continues to drop, the battery voltage may never get above the 3300 mV threshold needed to enable the transmitter, at which point we will lose the ability to monitor its status. Even if this does happen, however, we never really thought it would last this long. We would have been happy if it just worked, and really happy if it lasted a month or two. 19 months - this is way beyond what any of us expected!

As of June 25, 2015, the orbit has decayed by about 73 km since launch. Since April 21, 2015, it has been decaying at a rate of about 1 km per week. Apogee is now at 561 km, and perigee is at 529 km.

The following are the TLEs from 2015-06-25:

EAGLE 2

```
1 39436U 13066W 15176.16386703 .00013608 00000-0 90105-3 0 9991
2 39436 97.7444 252.3622 0022818 80.2035 280.1767 15.07230510 86697
```

Again, if anyone wants to make an attempt at predicting when it will de-orbit, here is some useful information:

Average cross-sectional area = 0.014252 m²

Mass = 210 g

Area/mass ratio = 0.06787 m²/kg

>From the 2015-06-25 TLEs:

Semi-major axis: 6922.8 km

Eccentricity: 0.0022818

Apogee: 560.6

Perigee: 529.0

As always, please post any telemetry, or for that matter, any reception reports to the Yahoo discussion group. We would especially like to encourage our friends in the southern hemisphere to listen for \$50SAT/M0-76/Eagle-2. We really appreciate everyone who has provided reception reports and telemetry as well as access to their WebSDRs. To date, we have 3,098 individual error-free telemetry captures, and the vast majority of these did not come from Stuart, Howie, or I.

73 Michael Kirkhart KD8QBA
\$50SAT/M0-76/Eagle-2 team

\$50SAT is one of the smallest amateur radio satellites ever launched at 5x5x7.5 cm and weighs only 210 grams. Transmitter power is just 100 mW on 437.505 MHz (+/-9 kHz Doppler shift) FM CW/RTTY. It uses the low cost Hope RFM22B single chip radio and PICaxe 40X2 processor.

\$50SAT has been a collaborative education project between Professor Bob Twiggs, KE6QMD, Morehead State University and three other radio

amateurs, Howie DeFelice, AB2S, Michael Kirkhart, KD8QBA, and Stuart Robinson, GW7HPW.

Further information in the \$50SAT Dropbox
<https://www.dropbox.com/sh/l3919wtfiyw2gf/-HxyXNsIr8>

There is a discussion group for \$50SAT
<http://groups.yahoo.com/groups/50dollarsat/>

50DollarSat <http://www.50dollarsat.info/>

{ANS thanks Michael KD8QBA and Southgate ARN for the above information}

International Space Colloquium at Guildford

The AMSAT-UK International Space Colloquium will be held on July 24-26 at the Holiday Inn, Guildford, GU2 7XZ, UK.

Among the speakers will be:

- Peter Guelzow DB20S with an update on AMSAT-DL projects, including the Phase 4 satellite
- Chris Brunskill, formerly of Surrey Space Centre (SSC), now working at the Space Catapult at the Harwell Campus. He will be presenting an extremely novel project aimed at schools and education
- It is hoped the BATC will be able to demonstrate live Digital TV reception from the International Space Station, using the Ham TV system
- Drew Glasbrenner K04MA, from AMSAT North America will be attending, and presenting the latest news of the FOX satellite(s) due for launch later this year, and also on their Phase 4 project

The Colloquium is open to all further information is at
<http://amsat-uk.org/colloquium/>

[ANS thanks AMSAT-UK for the above information]

WD9EWK California road trip July 9-13

Patrick WD9EWK/VA7EWK will be driving to southern California next Thursday (9 July), in advance of a presentation he will give for the Escondido Amateur Radio Society that evening. After that presentation, and after spending the next day (Friday, 10 July) in and around San Diego, he will head north. Other than a planned stop at the DM04/DM05 grid boundary north of Los Angeles (the same spot he stopped at last September, near Mojave CA and Edwards AFB), He may be going to head further north. He hopes to have some time to go either north through the San Joaquin Valley, or over to the Pacific coast, or some sort of loop to see a lot more of central California.

Whereas there is not a set itinerary for the portion of his trip after the DM04/DM05 stop, he has asked other satellite operators via Twitter for feedback on some grids that would make for worthwhile visits during his trip. Patrick is asking for feedback, "If I look to go up or down the Pacific coast, grids I could visit include CM94 through CM96, and possibly even as far north as Santa Cruz and the

almost-all-wet grid CM86. If I stay inland, DM0x grids would be where I'd probably drive through. I'm not planning to go all the way up to the Bay Area, although Santa Cruz is not that far from San Jose. Any thoughts from the crowd here, on grids that I should try to visit between 11 and 13 July?"

On his return trek to Phoenix on 13 July, he could be able to make a stop on the DM23/DM24 boundary, either north of Quartzsite on the Arizona side of the Colorado River, or just across the river along US-95 in California. This stop will depend on whether or not a satellite pass is available as he passes through that area. Patrick notes that he won't be passing that way on his trip out to San Diego.

During his travels he will be running APRS using WD9EWK-9, which should be visible on sites like <http://aprs.fi/WD9EWK-9>. Check his twitter feed, @WD9EWK, for updates. Any QSOs made will be uploaded to Logbook of the World.

[ANS thanks Patrick WD9EWK/VA7EWK for the above information]

ARISS Poster Presented at ISS R&D Conference

Frank Bauer, KA3HD0, on behalf of ARISS-US team will host a poster presentation "Educational Outreach and International Collaboration Through ARISS---Amateur Radio on the International Space Station" during the 4th Annual International Space Station Research and Development Conference July 7-9, 2015.

The poster is a collaborative work by members of the ARISS-US Executive team and outlines the objectives, capabilities, and impact that amateur radio plays in international collaboration and STEM education engagement aboard the International Space Station. Poster are available for viewing through the conference and are the center attraction during one of the receptions where Bauer will be available to answer questions. This is the second year that ARISS has been represented at the conference.

The ISS R&D conference is being held in the Marriott Copley Hotel in the center of Boston, MA.

Each morning of the 4th International Space Station Research & Development Conference will be webcast live starting at 8:00 am eastern on July 7. Opening remarks by Michael Suffredini, Manager, ISS Program Office, NASA JSC, will be followed by a conversation with Elon Musk, CEO and Lead Designer, SpaceX. To watch at no charge visit <http://www.issconference.org/livestream.php>

[ANS thanks ARISS, the American Astronautical Society for the above information]

Help Wanted - Editor-in-Chief for the AMSAT Journal

AMSAT is looking for an Editor-in-Chief for the AMSAT Journal. This position is now open due to the expansion of opportunities in the User Services Department. Our current editor, JoAnne Maenpaa, K9JKM, is also the Vice President of User Services. The Officers and the

Board have discovered that it is impossible for a single volunteer to accomplish management of the AMSAT Journal with the other pending User Services leadership requirements.

Hence we are planning on a handover in editorship when a suitable candidate is found. Experience with the Adobe InDesign CS6 publication system would be helpful (AMSAT provides the software). However, this publishing system resembles a word processor on steroids; while there is a learning curve it will not be impossible.

The editor-in-chief will continue to lead the team of Journal assistant editors arranging for content to publish. To volunteer send an e-mail to JoAnne Maenpaa, K9JKM at: k9jkm(a)amsat.org

[ANS thanks JoAnne K9JKM for the above information]

ARISS News

Recent Contacts

+ A telebridge contact with students at Universidad Tecnológica de Chile INACAP sede Temuco, Temuco, Chile was successful Fri 2015-06-26. Contact was established at about 18.50 UTC via ARISS ground station W6SRJ in Santa Rosa, CA, USA. Though the signal from the ISS was strong and clear, a delayed start for the interview meant that there was time for four questions for the Russian cosmonaut. Responding to one of the questions during the interview that was conducted in English, the Russian crew member explained that the temperature outside the ISS varies between +120° and -120° Celsius.

School Information:

We are a technical university located in Temuco city, 700 kms south of Santiago de Chile and we are planning this event together with telecommunications engineering area. Our university has direct contact with local schools which will be taking part on the event that day. We are planning to invite around 400-500 students because we will organize an open science fair called "telecommunications and space" and we will be teaching them radio communications, antennas and space science along with professional astronomers and engineers.

The children will be from five or six different schools located in Temuco and surrounding rural areas. We will coordinate with the schools to select the students and ask their own questions.

Upcoming ARISS Contact Schedule

+ A direct contact with students at Tulsa Community College, Northeast Campus, Tulsa, Oklahoma, USA was successful Wed 2015-07-01 15:59:17 UTC 20 deg. Students ranging in age from 60 to 13 asked cosmonaut Gennady Padalka, RN3DT thirteen questions. The interview included a question from a deaf engineering student that was managed through an interpreter. Preparing for the contact, students assembled the ground station that was used to make the contact and participated in an antenna design contest. Students tested their antennas by hand tracking the ISS. They practiced doing receiving tests with the assembled ground station prior to the day of the contact to sharpen their skills.

A video recording of the contact is available at:
<https://www.youtube.com/watch?v=TZVWkPPLCEM&feature=youtu.be>

School information:

TCC is Oklahoma's largest community college with more students and more degree earners than any other community college in the state. We offer students a choice of 235 associate degree and certificate of completion programs of study. TCC students come from every walk of life, and our graduates work in all sectors of business and industry to help build a stronger, more diverse economy. Four campuses (Metro, NE, SE, and W) serve the Tulsa, Oklahoma area.

If you're passionate about electronics, criminal justice, horticulture, engineering, computer networking, human services, fire emergency services, interpreter education or aviation science, "Northeast" is the campus for you. Located near Tulsa's industrial and aerospace hub, the campus is perfect if you're seeking a career in high-tech business or service-focused careers. Along with a strong educational curriculum, the campus is home to the Resource Center for the Deaf and Hard of Hearing, offering access to higher education for all segments of the population.

The TCC Electronics club started in the early 1980's on the NE Campus which is where the Electronics and Engineering Technology classes are offered. Amateur Radio activities were added in 2000 (the year an instructor came on board as the only HAM operator), and we became an "ARRL" affiliated club in 2005. Now the TCC-ARC station consists of two towers for HF and VHF, along with two EME and Radio Astronomy arrays.

Upcoming Contacts

A direct contact with students at Kopernik Observatory, Vestal, NY, USA is planned for the week of July 6. More details will be provided when the schedule is confirmed at www.ariss.org.

>From 2015-06-11 to 2015-07-24, there will be no US Operational Segment (USOS) hams on board ISS. So any school contacts during this period will be conducted by the ARISS Russia team.

[ANS thanks ARISS, Charlie AJ9N and David AA4KN for the above information]

Satellite Shorts From All Over**+ Space Related Special Event DX Short**

EUROPEAN RUSSIA, UA. Special event station UE40SA is QRV until July 20 to commemorate the Apollo-Soyuz Test Project 40 years ago. QSL via GM0WRR.

[ANS thanks ARLD026 DX news for the above information]

+ Forever Remembered exhibit

Astronaut artifacts line the walls of a new, permanent memorial called "Forever Remembered," at the Kennedy Space Center Visitor Complex in Florida. NASA and astronaut families collaborated on the memorial designed to honor the crews lost on missions STS-51L and STS-107, pay tribute to space shuttles Challenger and Columbia, and emphasize the importance of learning from the past. The memorial contains the largest collection of personal items of both flight crews and includes recovered hardware from both shuttles, never

before displayed for the public.

[ANS thanks This Week @ NASA for the above information]

+ NESC Academy Online

The NESC Academy was established by the NASA Engineering and Safety Center (NESC), headquartered at NASA Langley Research Center, to enable effective knowledge capture and transfer and ensure technical information remains viable and accessible.

The NESC Academy provides a forum through which senior technical experts can teach critical competencies required to effectively accomplish the NASA mission. The online courses were conducted by discipline experts and provide the unique opportunity to share critical knowledge with broad audiences in a self paced manner.

For more information visit
<http://nescacademy.nasa.gov>

[ANS thanks NASA-Space for the above information]

+ Fox-1 Update

As of Tuesday morning the GRACE mission CubeSats including Fox-1 were successfully transported to VAFB and mated to the Aft Bulkhead Carrier (ABC) plate. Wednesday instrumentation was completed, GRACE CubeSats are ready and waiting to be attached to the Centaur which should occur later this month.

[ANS thanks Jerry N0JY for the above information]

/EX

AMSAT User Services and the Editors of the AMSAT New Service pass on our condolences to ANS Weekly Co-Editor Joe Spier K6WAO and his family on the death of Joe's mother this week.

In addition to regular membership, AMSAT offers membership in the President's Club. Members of the President's Club, as sustaining donors to AMSAT Project Funds, will be eligible to receive additional benefits. Application forms are available from the AMSAT Office.

Primary and secondary school students are eligible for membership at one-half the standard yearly rate. Post-secondary school students enrolled in at least half time status shall be eligible for the student rate for a maximum of 6 post-secondary years in this status. Contact Martha at the AMSAT Office for additional student membership information.

73,
This week's ANS Editor,
EMike McCardel, KC8YLD
kc8yld at amsat dot org